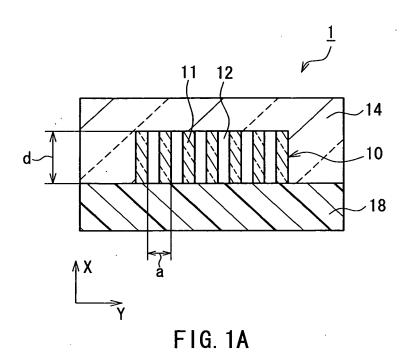
Inventor: NISHII et al.

Docket No.: 10873.1394US01

Title: OPTICAL ELEMENT, OPTICAL CIRCUIT PROVIDED WITH THE OPTICAL ELEMENT, AND METHOD FOR PRODUCING THE OPTICAL ELEMENT

Attorney Name: Douglas P. Mueller
Phone No.: 612.371.5237

Sheet I of 20



_10 ΛZ

FIG. 1B

Inventor: NISHII et al.
Docket No.: 10873.1394US01
Title: OPTICAL ELEMENT, OPTICAL CIRCUIT PROVIDED WITH THE OPTICAL
ELEMENT, AND METHOD FOR PRODUCING THE OPTICAL ELEMENT
Attorney Name: Douglas P. Mueller
Phone No.: 612.371.5237

Sheet 2 of 20

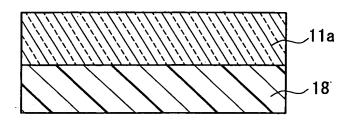


FIG. 2A

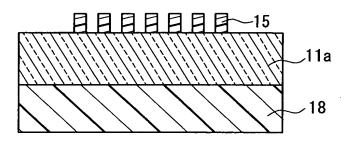


FIG. 2B

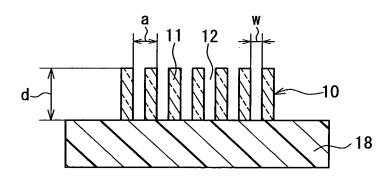


FIG. 20

6

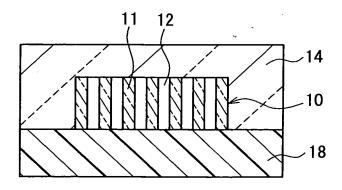
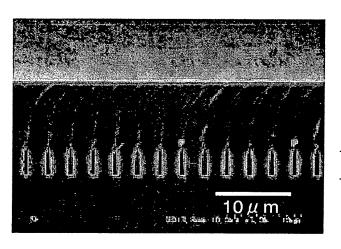


FIG. 2D

Inventor: NISHII et al.
Docket No.: 10873.1394US01
Title: OPTICAL ELEMENT, OPTICAL CIRCUIT PROVIDED WITH THE OPTICAL
ELEMENT, AND METHOD FOR PRODUCING THE OPTICAL ELEMENT
Attorney Name: Douglas P. Mueller
Phone No.: 612.371.5237
Sheet 3 of 20



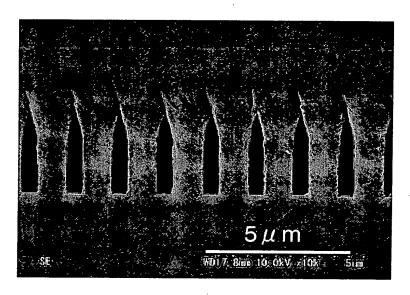
Covering layer

Periodic structure

Substrate

FIG.3

Inventor: NISHII et al.
Docket No.: 10873.1394US01
Title: OPTICAL ELEMENT, OPTICAL CIRCUIT PROVIDED WITH THE OPTICAL
ELEMENT, AND METHOD FOR PRODUCING THE OPTICAL ELEMENT
Attorney Name: Douglas P. Mueller
Phone No.: 612.371.5237
Sheet 4 of 20



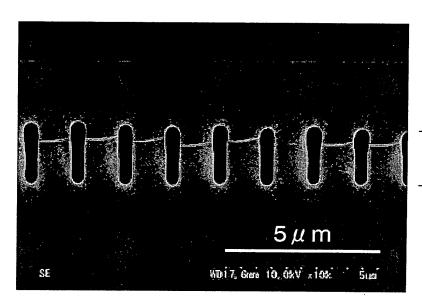
Covering layer

Periodic structure

Substrate

FIG.4

Inventor: NISHII et al.
Docket No.: 10873.1394US01
Title: OPTICAL ELEMENT, OPTICAL CIRCUIT PROVIDED WITH THE OPTICAL
ELEMENT, AND METHOD FOR PRODUCING THE OPTICAL ELEMENT
Attorney Name: Douglas P. Mueller
Phone No.: 612.371.5237
Sheet 5 of 20



Covering layer

Periodic structure

Substrate

FIG.5

Inventor: NISHII et al.
Docket No.: 10873.1394US01
Title: OPTICAL ELEMENT, OPTICAL CIRCUIT PROVIDED WITH THE OPTICAL
ELEMENT, AND METHOD FOR PRODUCING THE OPTICAL ELEMENT
Attorney Name: Douglas P. Mueller
Phone No.: 612.371.5237
Sheet 6 of 20

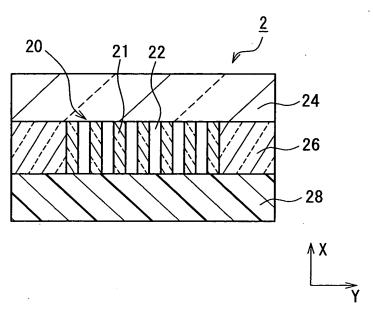


FIG. 6A

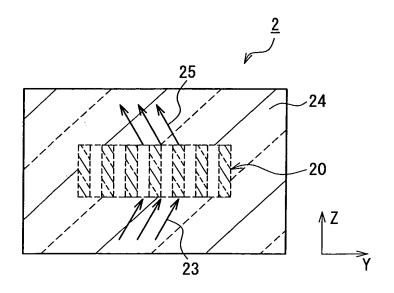


FIG. 6B

Inventor: NISHII et al.

Docket No.: 10873.1394US01

Title: OPTICAL ELEMENT, OPTICAL CIRCUIT PROVIDED WITH THE OPTICAL

ELEMENT, AND METHOD FOR PRODUCING THE OPTICAL ELEMENT

Attorney Name: Douglas P. Mueller

Phone No.: 612.371.5237

Sheet 7 of 20

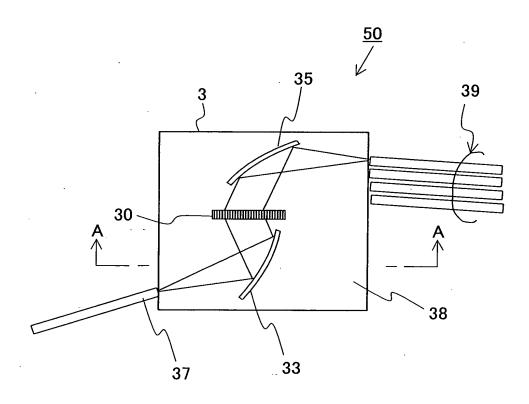


FIG.7A

Inventor: NISHII et al.
Docket No.: 10873.1394US01
Title: OPTICAL ELEMENT, OPTICAL CIRCUIT PROVIDED WITH THE OPTICAL
ELEMENT, AND METHOD FOR PRODUCING THE OPTICAL ELEMENT
Attorney Name: Douglas P. Mueller
Phone No.: 612.371.5237
Sheet 8 of 20

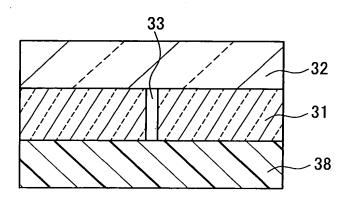
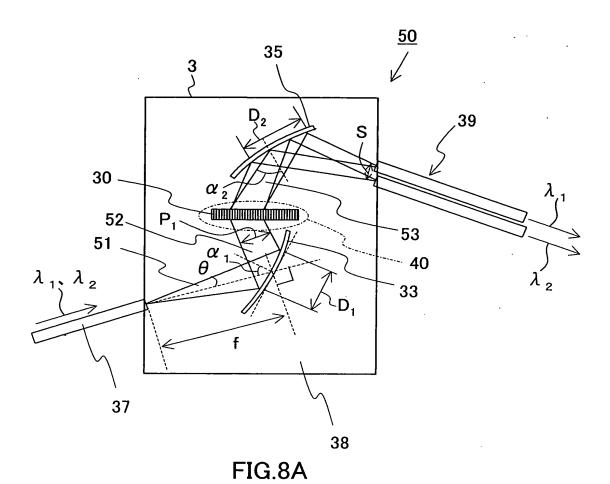


FIG. 7B

Inventor: NISHII et al.
Docket No.: 10873.1394US01
Title: OPTICAL ELEMENT, OPTICAL CIRCUIT PROVIDED WITH THE OPTICAL
ELEMENT, AND METHOD FOR PRODUCING THE OPTICAL ELEMENT
Attorney Name: Douglas P. Mueller
Phone No.: 612.371.5237
Sheet 9 of 20



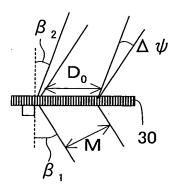


FIG.8B

Inventor: NISHII et al.
Docket No.: 10873.1394US01
Title: OPTICAL ELEMENT, OPTICAL CIRCUIT PROVIDED WITH THE OPTICAL
ELEMENT, AND METHOD FOR PRODUCING THE OPTICAL ELEMENT
Attorney Name: Douglas P. Mueller
Phone No.: 612.371.5237
Sheet 10 of 20

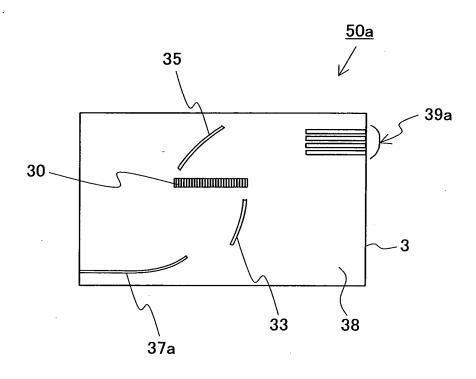


FIG.9

Inventor: NISHII et al.

Docket No.: 10873.1394US01

Title: OPTICAL ELEMENT, OPTICAL CIRCUIT PROVIDED WITH THE OPTICAL ELEMENT, AND METHOD FOR PRODUCING THE OPTICAL ELEMENT

Attorney Name: Douglas P. Mueller
Phone No.: 612.371.5237

Sheet 11 of 20

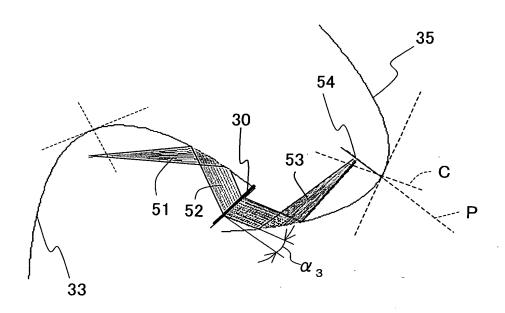


FIG.10

Inventor: NISHII et al.
Docket No.: 10873.1394US01
Title: OPTICAL ELEMENT, OPTICAL CIRCUIT PROVIDED WITH THE OPTICAL
ELEMENT, AND METHOD FOR PRODUCING THE OPTICAL ELEMENT
Attorney Name: Douglas P. Mueller
Phone No.: 612.371.5237
Sheet 12 of 20

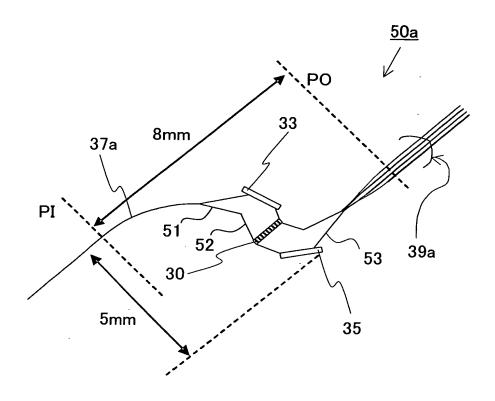


FIG.11

Inventor: NISHII et al.
Docket No.: 10873.1394US01
Title: OPTICAL ELEMENT, OPTICAL CIRCUIT PROVIDED WITH THE OPTICAL
ELEMENT, AND METHOD FOR PRODUCING THE OPTICAL ELEMENT
Attorney Name: Douglas P. Mueller
Phone No.: 612.371.5237
Sheet 13 of 20 <u>50d</u> FIG.12A 35 39a 30 33 37a <u>50e</u> FIG.12B 30 33 35 39a 37a <u>50f</u> 33 35 FIG.12C - 39a 37a 30 <u>50g</u> FIG.12D 30 33 35

39a

37a

Inventor: NISHII et al.
Docket No.: 10873.1394US01
Title: OPTICAL ELEMENT, OPTICAL CIRCUIT PROVIDED WITH THE OPTICAL
ELEMENT, AND METHOD FOR PRODUCING THE OPTICAL ELEMENT

Attorney Name: Douglas P. Mueller Phone No.: 612.371.5237

Sheet 14 of 20

FIG. 13A

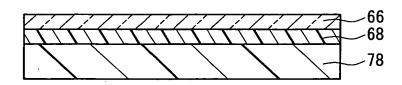


FIG. 13B

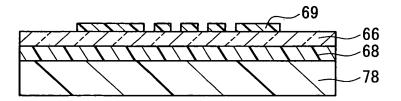


FIG. 13C

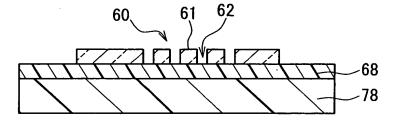
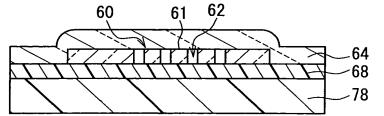
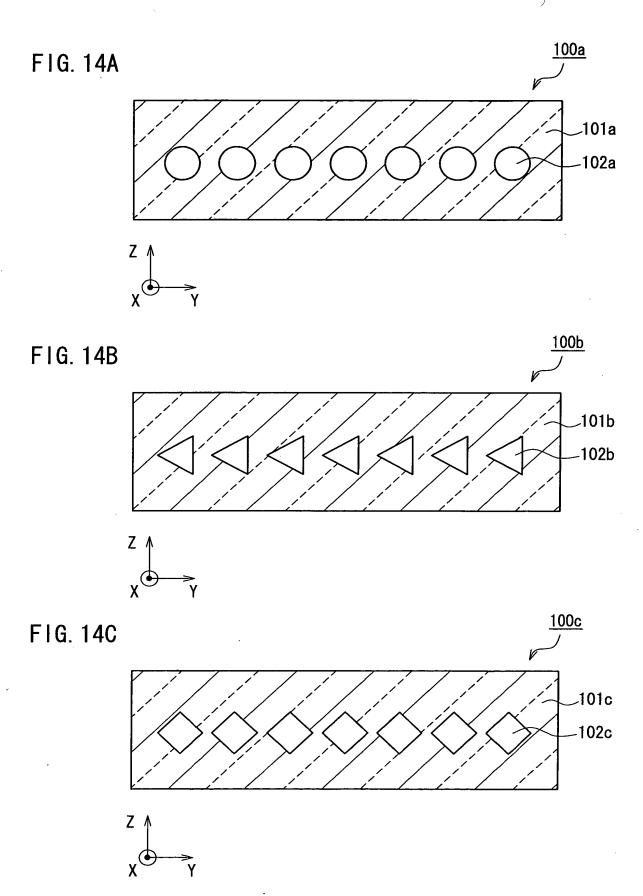


FIG. 13D



Inventor: NISHII et al.
Docket No.: 10873.1394US01
Title: OPTICAL ELEMENT, OPTICAL CIRCUIT PROVIDED WITH THE OPTICAL
ELEMENT, AND METHOD FOR PRODUCING THE OPTICAL ELEMENT

Attorney Name: Douglas P. Mueller Phone No.: 612.371.5237 Sheet 15 of 20



Inventor: NISHII et al.
Docket No.: 10873.1394US01
Title: OPTICAL ELEMENT, OPTICAL CIRCUIT PROVIDED WITH THE OPTICAL
ELEMENT, AND METHOD FOR PRODUCING THE OPTICAL ELEMENT
Attorney Name: Douglas P. Mueller
Phone No.: 612.371.5237
Sheet 16 of 20

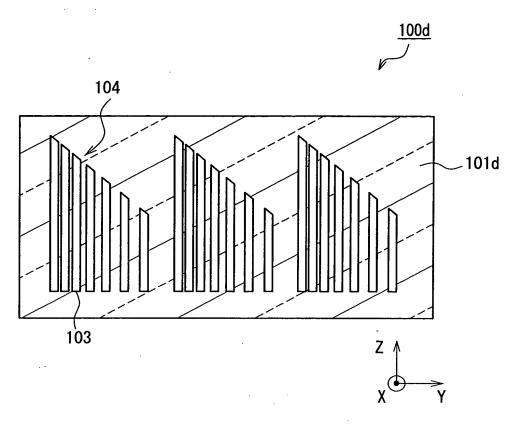


FIG. 15

Inventor: NISHII et al.

Docket No.: 10873.1394US01

Title: OPTICAL ELEMENT, OPTICAL CIRCUIT PROVIDED WITH THE OPTICAL ELEMENT, AND METHOD FOR PRODUCING THE OPTICAL ELEMENT

Attorney Name: Douglas P. Mueller
Phone No.: 612.371.5237

Sheet 17 of 20

FIG. 16A

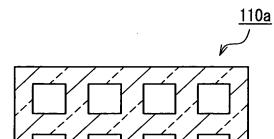


FIG. 16B

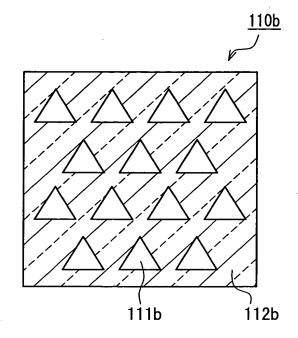
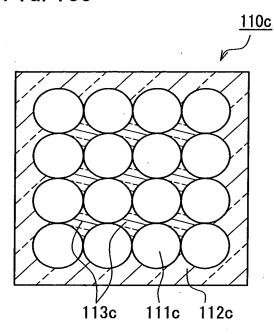


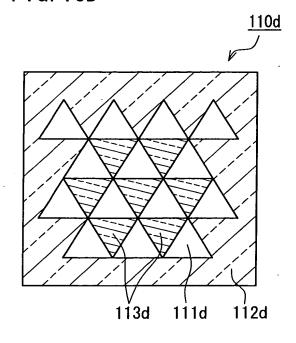
FIG. 16C



111a

112a

FIG. 16D



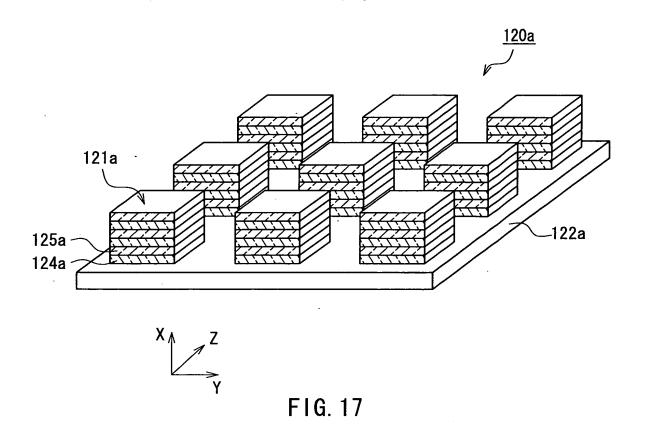
Inventor: NISHII et al.

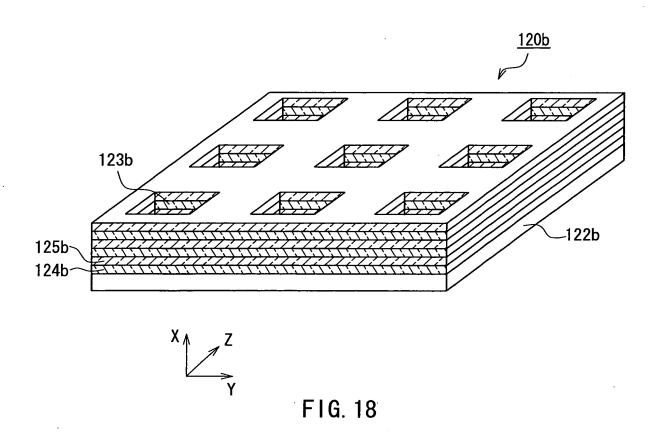
Docket No.: 10873.1394US01

Title: OPTICAL ELEMENT, OPTICAL CIRCUIT PROVIDED WITH THE OPTICAL ELEMENT, AND METHOD FOR PRODUCING THE OPTICAL ELEMENT

Attorney Name: Douglas P. Mueller
Phone No.: 612.371.5237

Sheet 18 of 20





Inventor: NISHII et al.

Docket No.: 10873.1394US01

Title: OPTICAL ELEMENT, OPTICAL CIRCUIT PROVIDED WITH THE OPTICAL ELEMENT, AND METHOD FOR PRODUCING THE OPTICAL ELEMENT Attorney Name: Douglas P. Mueller
Phone No.: 612.371.5237

Sheet 19 of 20

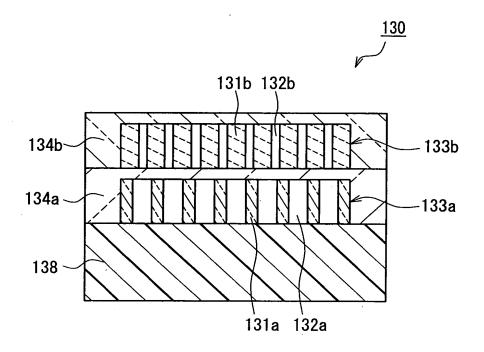


FIG. 19

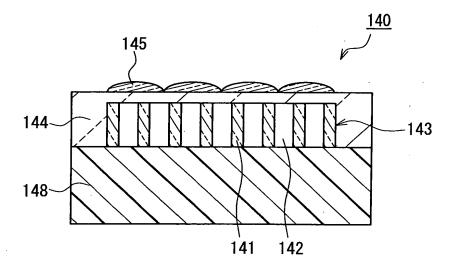


FIG. 20

Inventor: NISHII et al.
Docket No.: 10873.1394US01
Title: OPTICAL ELEMENT, OPTICAL CIRCUIT PROVIDED WITH THE OPTICAL
ELEMENT, AND METHOD FOR PRODUCING THE OPTICAL ELEMENT
Attorney Name: Douglas P. Mueller
Phone No.: 612.371.5237
Sheet 20 of 20

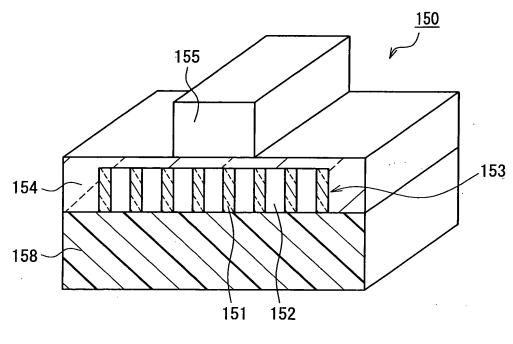


FIG. 21